Relationship Between Real Estate Indices and Inflation Trends: An Application to the European Residential Property Market

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Abstract. The present paper aims to analyse the European residential real estate market through a set of indicators elaborated by Eurostat. By means of the use of correlation analysis, the comparison of several housing market indicators related to European nations enables the creation of a synthetic and unambiguous representation of the residential property market trend, as well as the comprehension of the dynamics that are seen within each nation and of the relationships that exist between the indicators with nations. The use of deflated indicators and the analysis of inflation trends has allowed us to highlight the peculiarities of the Italian residential property market and its ability to act as a safe-haven asset.

Keywords: Inflation · Housing prices · Real estate portfolio

1 Introduction

The role of the real estate investment in the context of the global economy is a controversial issue. The idea that real estate allows to protect capital from the depreciation due to inflation is widespread among investors, but the validity of this assumption is often called in questions especially during periods of uncertainty.

In Italy in January 2024, the estimated National consumer price index for the Whole Community (NIC) gross of tobacco [1], and the consumer price index for Manual and Non-manual workers' Families (FOI) [2] both register an increase of 0.8% on a yearly basis. In December 2023 the producer prices of construction for "Residential and non-residential buildings" increased by 0.4% on a yearly basis, while industrial producer prices fall by 16.0% on a yearly basis [3].

The uncertainty deriving from the rise of inflation rate and construction prices is also fuelled by the energetic crisis and the tensions in the current geopolitical backdrop. In such unpredictable circumstances it is questionable whether the real estate is a good hedge against inflation and, thus, an advantageous asset class to invest in, with an appropriate return with respect to the risks involved.

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O. Gervasi et al. (Eds.): ICCSA 2024 Workshops, LNCS 14818, pp. 113–125, 2024.
https://doi.org/10.1007/978-3-031-65273-8_8

2 Aim

The objective of the present research is to determine whether investing in the residential real estate is an appropriate choice in order to hedge the capital against inflation, namely if the residential property investments reliably perform as shield against the loss of the nominal value of households' savings due to inflation.

Such issue can be addressed by exploring how house prices behave in relation to the fluctuations in the level of inflation. Practically, the aim of this work is to find the relationship between the characteristics of the residential real estate market and the trend in consumer prices inflation in the European economic context, in order to determine to what extent the real estate can be considered as a safe haven.

In the next sections of this work, a portion of the scientific literature on the dynamics of residential markets and their relationship to inflation and other socioeconomic indicators is reviewed. The next paragraph focuses on methodological suggestions and data sources. The last phase involves putting the case study into practice. This is done by conducting two correlation analyses, each from a different perspective, using data related to the European Union. After looking over the empirical findings, some recommendations for residential real estate investment guidelines are made.

3 Literature Review

The scholarly research on the influence of rising prices for goods and services on price increases for homes frequently seeks to determine if a residential property is an investment capable of protecting investors' equity from the negative repercussions of inflationary processes. It is feasible to claim that research on this subject does not always yield comparable outcomes based on the sample of papers examined for this study's scope.

In general, the majority of the analyzed papers find an existing correlation between house prices dynamics and inflation. For example, Goodhart and Hofmann [4] report that residential properties inflation is one of the three most influential factor in the prediction of future consumer price inflation, while Tsatsaronis and Zhu [5] detect that inflation is the most influential determinant of the changes in housing price, in particular when inflation rate is high.

In the most part of the studies in which a correlation is identified, this turns out to be positive [6]. Specifically, several studies [7–10] agree on the asymmetry of such positive relation, with a bigger impact of inflation on housing prices than that of housing prices on inflation, and outline that residential properties investments effectively hedge inflation, as also reported by Wu and Tidwell [11], Christou et al. [12], Tsatsaronis and Zhu [5].

The empirical literature on this subject generally suggests that the residential property presumably has inflation-hedging characteristics. Nonetheless there is no absolute agreement on this assumption and, more in general, on the existence and the typology of relation between inflation and house prices trends.

Various deductions can be drawn from the same empirical analysis depending on how certain parameters are changed, such as the geographic or temporal focus on which

housing market data is observed, as well as the varied data sources and methodology that are utilised. Wu and Tidwell [11] highlight that the inflation-hedging efficacy depends on the analyzed area of the real estate market. Tsatsaronis and Zhu [5] remark that this efficacy is bigger during the high-inflation periods. Azmi et al. [13] outline that the residential property can generally be considered as a partially inflation-hedging asset, but the extent of this characteristic depends on the specific property market (geographical collocation and market behavior) and on the specific asset typology. Lee [14] finds out that investing in small and medium size real estate assets during high inflation periods contributes to the preservation of purchasing power. Instead, during the low inflation and deflation periods, investment on residential properties is not an advisable choice. Nneji et al. [15] claim that movements in the inflation rate notably impact on house prices in the steady-state and boom regimes only, while a disconnection between them is reported during the housing busts. Clapp and Giaccotto [16] distinguish among expected and unexpected inflation, finding that the former is negatively related while the latter is positively correlated with housing prices.

The study carried out by Demary [17] demonstrates that changes in house prices can be used as an indicator of forthcoming inflation, in accordance with Goodhart and Hofmann [4]. But, in contrast with the other studies mentioned above, this study finds that a negative relationship exists between these two elements. In fact, as a consequence of an inflationary shock the house prices show a gradually decreasing trend, which can be due to the rise in interest rates. This result in contrast with the majority of the literature can be attributed to the fact that a simplified methodology was employed. Demary [17] also shows that the volatility of housing prices is higher than the volatility of cyclical components of inflation, in agreement with the results obtained by Tang et al. [18] which show a higher House Price Index (HPI) aggregate growth rate compared to that of inflation. This finding makes the real estate investment profitable in periods of rapid market growth. Nevertheless, Tang et al. [18] do not detect any significant long-run transmission between housing prices and actual, expected or unexpected inflation, demonstrating that housing price cannot hedge inflation in the Chinese market. The authors attribute the reason for the discrepancy between their findings and those of previous Chinese housing market studies to the use of different data sources, different methodologies and different composition of the employed indicator. Wolski [19] achieves comparable outcomes in a different real estate market. For the Polish real estate market, there exists no short-term relationships between residential property prices and inflation indexes. The author explains this lack of correlation with the fact that the analyzed market is shallow, and that the research period is short and only includes a little period of elevated inflation.

4 Methodology

The eventual existence of a relationship between the house prices and consumer prices inflation can be investigated through a correlation analysis, that eventually reveals also what kind of relationship it is in terms of type and strength. Indeed, based on the correlation coefficient it is possible to deduce if two variables have a linear association, if this possible relationship is positive or negative, and if it is weak, moderate or strong.

Specifically, two different correlation analyses will be carried out: (i) the first one will be performed between the various selected variables, for each country, and (ii) the

second one will be implemented between the different countries, for each variable. Consequently, two different groups of correlation matrices will be produced: the first group investigates different real estate phenomena (represented by diverse variables) within each single country; meanwhile each matrix belonging to the second group analyzes the possible relationship existing for a given phenomenon among different countries.

The characteristics of the housing market and the trend of consumer prices in the European Union area can be observed through the indicators and variables provided by the Eurostat database [20]. The consistency among the national data collection and elaboration is a significant benefit of using this sort of information source.

For each of the following indicators annual data were chosen, rather than monthly and quarterly ones, in order to observe the evolution of values from a broader point of view. Moreover, the average indices were always preferred over the rates of change. For consistency and unity of perspective, all the annual average indices picked up were referred to 2015 as the base year, namely the year in which each index value is conventionally set to equal 100. The gathered information covers the years 2010–2022, which is a little period of time but guarantees the ongoing existence of the historical series, what has also been used as a criterion for choosing the indicators and the member states to look at.. As regards the geographical coverage of the investigation, national data were collected for 24 member countries of the European Union equipped with available and complete time series of the indicators deemed consistent with the scope of the work.

The Eurostat "Detailed dataset" describes 9 different statistical themes, among which the "Economy and finance" section collects the majority of indicators concerning the subject matter of this work. In fact, in the sub-category "Prices" it is possible to find the House Price Index (HPI), the Owner-Occupied House Price Index (OOHPI) and the Harmonised Index of Consumer Prices (HICP). Meanwhile the deflated version of the HPI is included in the "EU policies" dataset.

Firstly, the HPI is important because it captures the changes in transaction prices of all types of dwellings, both new and existing, purchased by households from any sector and for any purpose (e.g. owner-occupancy, rent, investment etc.). This index measures inflation in the housing market. The HPI is available with respect to purchases of newly built dwellings and purchases of existing dwellings separately, but also with regards to all purchases. The inflation-adjusted version of the latter is the deflated HPI, which is therefore an interesting indicator to be considered.

Another indicator considered in the empirical analysis is OOHPI, which is more inclusive than HPI from the point of view of the encompassed expenditures and narrower than HPI as regards the purpose of the purchases. While the prices considered for the calculation of the HPI only take into account the purchase price of a property excluding additional expenses which arise for ownership and maintenance purposes (e.g. fees, commissions, major repairs etc.), the OOHPI incorporates all of these costs. Moreover, OOHPI covers the owner-occupancy as the only dwelling acquisition purpose: this indicator solely refers to the dwellings which are owned and occupied by the same household. To be more specific, the OOHPI encompasses the changes in prices incurred by households (i) for the "acquisition of dwellings" that were previously outside the household sector, for the purpose of owner-occupancy, and (ii) for the "ownership of dwellings", which are consequent to the occupancy of the property. The "existing dwellings new

to households" and "self-build dwellings and major renovations" sub-components are excluded because data are not available for every considered European country. The sub-component called "other services related to the acquisition of dwellings" is also excluded because it regards some factors which are not relevant for the scope of this study, such as property transfer tax, notary fees and real estate agent commissions. The second component, related to the ownership, is investigated only with regards to the "major repair and maintenance" sub-component, because it has a more significant weight on the total. In fact, the weight associated with this sub-component is 187.2 in EU, compared with 24.0 corresponding to "insurance connected with dwellings" and 8.8 related to "other services related to ownership of dwellings". Moreover, the home insurance market is not widespread in Italy and in many other European countries, which causes a low incidence of insurance costs for residential property on the total costs incurred by households and consequent a low relevance of such indicator. [21].

Lastly, in this analysis the HICP is considered in terms of overall index representing all-items inflation. As regards housing, the HICP solely includes actual rents, incurred by tenants, and light maintenance costs, incurred by renters and owner-occupiers [22].

It is possible, but in this case it is not necessary, to separately consider the HICP related to Housing, which is one of the 12 division according to the European Classification of Individual Consumption according to Purpose (ECOICOP) and includes (i) actual rentals for housing, (ii) imputed rentals for housing, (iii) maintenance and repair of the dwelling, (iv) water supply and miscellaneous services relating to the dwelling, (v) electricity, gas and other fuels. The individual investigation of this portion of expenditures, which is exclusively related to the dwelling's ownership, is not necessary to accomplish the scope of this analysis because the focus is mainly on transaction prices for the dwelling's acquisition.

As mentioned above, also the evolution of the costs of the production factors (mostly labor, material and energy), and consequently the evolution of the prices proposed by the building constructor to the client, have a strong influence on house prices. Eurostat describes these two aspects providing respectively the Construction Cost Indicator (CCI) and the Construction Producer Price Index (CPPI), but in this analysis they are excluded because they are both solely focused on the economic activity of new residential buildings' construction. Moreover, complete CCI time series are not available for some of the 24 analysed countries, and the HICP is representative of these aspects because it reflects the price development of factors of production such as materials and energy.

Table 1 captures the selected Eurostat variables and their definitions.

Table 1. List of the considered Eurostat indicators and the associated description.

N.	Eurostat indicator	Description
1	House Price Index - HPI	Index which measures the movements in prices of all dwellings bought by households, independently of their previous owners and the purpose of the purchase. The land component is included

(*continued*)

Table 1. (*continued*)

N.	Eurostat indicator	Description
2	HPI, purchases of newly built dwellings	HPI limited to purchases of newly built dwellings
3	HPI, purchases of existing dwellings	HPI limited to purchases of existing dwellings
4	Deflated HPI	It is the ratio between the HPI and the national accounts deflator for private final consumption expenditure. Thus, it quantifies inflation in the residential property market with respect to that in the private final consumption expenditure of households and non-profit institutions serving households (NPISHs)
5	Owner-Occupied Housing Price Index - OOHPI	Index measuring changes in (i) prices incurred by owner-occupiers (households living in a dwelling that they own) for the initial acquisition of dwellings that are new to household sector, and (ii) in other costs related to the ownership of dwellings
6	OOHPI, acquisition of dwellings	Index measuring changes in expenditures incurred by households for the initial acquisition of dwellings that are new to household sector (new dwellings; existing dwellings new to households) and other services related to the acquisitions of dwellings
7	OOHPI, new dwellings	It reflects changes in prices incurred by own-occupies for new dwellings (newly built dwellings' acquisition; expenditures for self-built dwellings and for major renovations)
8	OOHPI, purchases of newly built dwellings	It reflects changes in prices for newly built dwellings purchased by households for their own use. Similar to "HPI, purchases of newly built dwellings" but: (i) purchases for purposes different from owner-occupancy are included in HPI and not in OOHPI; (ii) in the OOHPI the land value is excluded from weights but included in prices, while in the HPI the land value is included in both weights and prices
9	OOHPI, major repair and maintenance	It is a sub-category of OOHPI related to the ownership of dwellings. It reflects the change in the owner-occupier's expenditure for the major repair and maintenance of the dwellings they own and in which they live
10	Harmonised Index of Consumer Prices - HICP	HICP provides a standardized and comparable measure of inflation for countries and country groups. It measures the movements over time in prices of consumer goods and services acquired by households

5 Case Study

The two correlation analyses, which were previously introduced, are performed on the data for the ten selected Eurostat indicators for the 2010–2022 period with regards to the 24 European Member States for which complete series are available (Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Spain, France, Croatia, Italy, Cyprus, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Sweden). In addition to the data for individual countries, the analysis was also performed with regards to the EA-20 and EU-27 aggregates, which are the aggregate indices covering respectively the countries of the Euro Area (20, from 2023) and all the European Union countries (27, since 2020) [23].

5.1 Correlation Analysis for Indicators Comparison

The first correlation analysis allows to investigate the trends of different real estate phenomena, represented by the selected indicators variables, within each single country.

The obtained results are similar when such analysis is performed on the data for the vast majority of the 24 EU countries taken individually, for the 20 EA aggregate and for the 27 EU aggregate (see Table 2): the existence of a strong positive correlation is detected among the variables describing real estate market and inflation dynamics. A different behaviour can be observed only in a few countries: the results of the first correlation analysis for Italy (see Table 3), Cyprus and Romania show inhomogeneity in the obtained correlation coefficients, with some indicators being positively correlated, some others being negatively correlated, and with a wide and varied range of coefficients.

Specifically, by looking at the correlation coefficients among Italian indicators it is possible to notice that in the Italian housing market the HPI for all dwellings has a strong positive correlation (0.99) with the HPI for existing dwellings, while it is weakly positively correlated (0.23) with the HPI for new dwellings. Consistently, the deflated HPI turn out to have a strong positive correlation (0.97) with the HPI for existing dwellings and a weak negative relationship (–0.12) with the HPI for new dwellings. This is confirmed by the fact that outcomes of the correlation analysis between the total HPI and each other indicator are similar to those obtained analysing the correlation between the existing dwellings HPI and the remaining indicators, in both cases contrasting with European results. Opposite results instead stand out from the correlation analysis between the new dwellings HPI and the other indicators, which generally show the existence of strong positive relationships, in compliance with the results observed at the European level.

The behavioural similarity reported for the market of existing dwellings and for the overall national housing market may be a consequence of the preponderance of the existing properties with respect to the entirety of Italian residential real estate assets. However, this consideration is valid for the majority of EU Member States, as proven by 2023 data about weights of newly built and existing dwellings in total dwellings [24], therefore it is not a satisfactory explanation of the difference between the behaviour of the Italian real estate market and that of the majority of European countries. Another possible explanation for this finding is the different effect exerted by location on the price formation for new and existing buildings. In fact, existing buildings are typically

located in urban areas which are well equipped with road infrastructure and served by public transport, activities, and essential services. Differently, new buildings are mainly located in peripheral areas which do not dispose of such facilities. The differences in location, and specifically in the characteristics of the urban area, strongly influences house prices. In the Italian housing market, which is subdivided into OMI zones reflecting the characteristics of different locations [25], there is a wide gap among house prices in central and in peripherical areas, with rising house prices by switching from no-urban areas to urban ones, and furtherly increasing for metropolitan zones. This can depend on the contrast between the high demand for housing services and the low elasticity of housing supply, on many social and economic indicators [26], but also on the quality and on the typology of the urban area. In fact, d'Acci [27] has found that in Italy a 1% increase in the quality of the urban area in which the property is located results in a 0.58% increase in its value; in addition, Casolaro and Fabrizi [28] demonstrated that the correlation between the quality of housing and house prices turns out to be stronger in the municipalities outside of the metropolitan areas.

The difference in the correlation coefficients measured among each indicator and, respectively, the HPI for new dwellings and the HPI for existing ones is consistent with the nearly absent correlation between these two HPIs (0.10). In fact, the existing and new housing markets behave differently in relation to inflationary dynamics: there is a strong positive relationship between the HPI for new dwellings and the HICP (0.71), while there is a moderate negative relationship (–0.60) between the HPI for existing dwellings and the HICP. On the one hand, the reason of this finding can be associated to the close link between the prices of the factors of production and the newly built houses: in high inflation periods the prices of materials and energy increase, leading to higher construction costs incurred by building contractors and consequently to higher prices for newly built dwellings. On the other hand, high inflation causes a reduction in consumers' purchasing power and, hence, the prices of existing houses are forced to contract.

The results of the first correlation analysis for Italian data (i) between the OOHPI categories and the HPI for new dwellings, (ii) among the several categories of the OOHPI, and (iii) between the OOHPI categories and HICP, are consistent with those obtained at the European level. Moderate and strong relationships (from 0.60 to 1) exist among the different categories of OOHPI and also between such categories and the HPI for new dwellings, while a strong positive correlation (from 0.71 to 0.92) is captured between the OOHPI and the HICP. This finding indicates that, when focusing exclusively on the retail residential real estate market, concerning the purchases of the "first home" and leaving aside the acquisitions for investment purposes, the Italian market follows the prevailing European trend. Differently, the relationships existing between the OOHPI categories and, respectively, the total HPI, the HPI for existing dwellings and the deflated HPI, range from a weak positive correlation (0.23) to a strong negative one (–0.85). Outcomes similar to those obtained for Italy also result, even if in a less marked way, when performing the first correlation analysis on data from Cyprus and Romania.

Table 2. First correlation analysis among the ten selected Eurostat indicators (numbered according to Table 1), with reference to European Union - 27 countries (from 2020).

EU-27	1	2	3	4	5	6	7	8	9	10
1	1.00									
2	1.00	1.00								
3	1.00	1.00	1.00							
4	0.98	0.98	0.98	1.00						
5	0.99	0.99	0.99	0.94	1.00					
6	0.99	0.99	0.99	0.94	1.00	1.00				
7	0.99	0.99	0.99	0.94	1.00	1.00	1.00			
8	1.00	1.00	1.00	0.98	0.98	0.99	0.99	1.00		
9	0.96	0.96	0.96	0.89	0.99	0.99	0.99	0.96	1.00	
10	0.92	0.92	0.92	0.83	0.97	0.97	0.97	0.92	0.92	1.00

Table 3. First correlation analysis among the ten selected Eurostat indicators (numbered according to Table 1), with reference to Italy.

Italy	1	2	3	4	5	6	7	8	9	10
1	1.00									
2	0.23	1.00								
3	0.99	0.10	1.00							
4	0.94	–0.12	0.97	1.00						
5	–0.22	0.89	–0.34	–0.53	1.00					
6	–0.03	0.96	–0.16	–0.36	0.98	1.00				
7	–0.31	0.85	–0.43	–0.62	0.99	0.96	1.00			
8	0.23	1.00	0.10	–0.12	0.89	0.96	0.85	1.00		
9	–0.63	0.60	–0.72	–0.85	0.89	0.79	0.93	0.60	1.00	
10	–0.50	0.71	–0.60	–0.76	0.92	0.85	0.96	0.71	0.96	1.00

5.2 Correlation Analysis for Geographical Comparison

The second correlation analysis allows the comparison between different countries of the same phenomenon among those described by the previously introduced indicators. Such analysis highlights that the Italian HPI (especially with regards to existing dwellings) and its deflated version are negatively correlated with those of almost all the European countries, which are instead characterised by similar behaviours, hence strongly positively correlated.

The only large European country which is not perfectly aligned to the European average is Spain, while Cyprus and Romania turn out to be quite uncorrelated to the rest

of Europe. The graph in Fig. 1 presents the comparison of the main indicators, namely the HPI, the deflated HPI and the OOHPI, with regards to Italy, Europe and other Member States such as Germany, Spain and France. It is interesting to outline that Italy follows a pattern which is symmetrical to the European average, and also a more limited range of fluctuations appear in the period 2010–2022.

Specifically, a closer inspection of the total HPI graph reveals different trends in the European countries: a linear growth in Germany; in France, in compliance with the average European behaviour, a constant trend in the period 2010–2014 and a growing trend from 2014 onwards; for Spain, a sharp decrease until 2013 and a sharp turnaround from 2013 onwards; in Italy, a sinusoidal trend with temporally shorter cycles but shorter excursions, and a slower recovery of HPI. The same dynamics can be seen with reference to the deflated HPI, but with less pronounced growth trends especially from 2021 because of the strong inflation observed from such year onwards.

Finally, for all the in countries with the exception of Italy, the graphical representation of total OOHPI shows results similar to those shown for HPI, although with minor variations; in Italy there is a total OOHPI less variable in the period analysed; differently, in Italy the total OOHPI was less variable in the analysed period.

5.3 Conclusions for Investment Portfolio

As highlighted in the previous analyses, the purchase of a residential property with the aim of including it in the investment portfolio can generally be an advantageous choice for the investor [29]. Some of the possible benefits that this kind of investment can provide are increased income flow and protection against inflation.

However, the extent to which this choice is convenient depends on various factors such as the type of property, thus the chosen sub-sector of the residential real estate market, and the current market conditions, related to the geographical area in which the property is located and the characteristics of the specific local market.

Thus, the first way to protect the capital through the diversification towards risk is to differentiate the real estate portfolio from a typological point of view. A distinctive feature of the Italian housing market, which can assist Italian investors in the selection of the more convenient property type, is the weak correlation among the existing dwellings market and the new dwellings one. This finding allows investors to minimize the risks that they face when they build a portfolio of real estate assets, even when it is uniform in terms of residential use, by diversifying it across new and existing properties.

Another way to minimize the risks linked to the real estate investment regards the geographical diversification of the portfolio on a European scale. Investing in the real estate markets of different nations which are correlated by a strong positive relationship, as most European countries are, may not be safe. Conversely, the negative correlation existing between Italy and the majority of other European Member States with regards to the HPI makes the investment in the Italian housing market highly attractive. The discrepancy between the behaviour of the Italian market and that of other European countries, indeed, is a beneficial characteristic when it comes to diversifying the portfolio with the goal of consequently minimising risks.

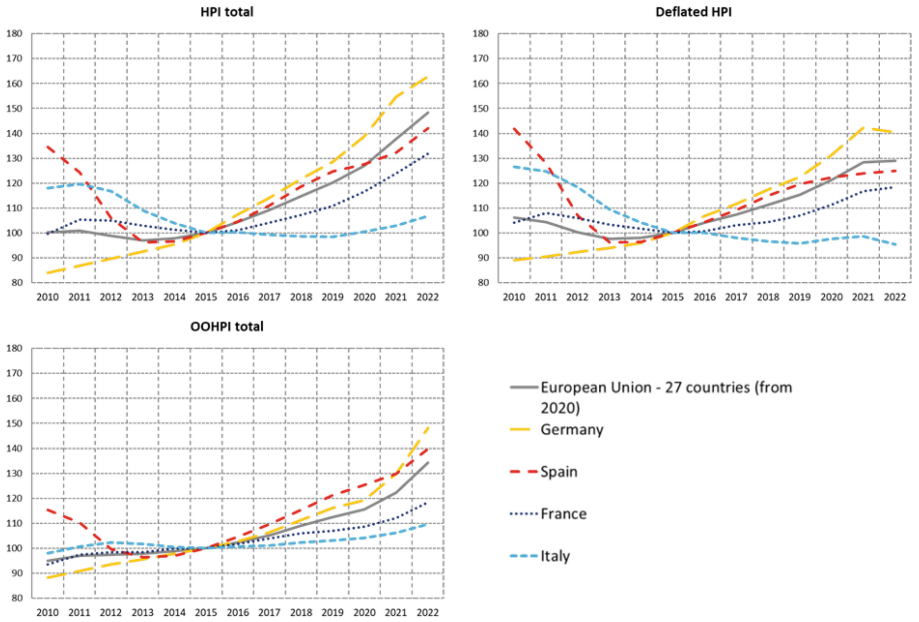

Fig. 1. Graphical comparison of the HPI total, the deflated HPI and the OOHPI total from five geographical points of view: EU-27 aggregate, Germany, Spain, France, Italy.

6 Conclusions

The analysis of the European residential property market, through the main indicators developed by Eurostat, showed a homogeneous behaviour of most countries and, in general, a high correlation between house prices and inflation.

Italian housing market's behaviour turns out to differ, at least in part, from the average European one, probably due to its distinctive features: the fact that households play a predominant role in the market, and the specificities of the existing properties (included in the corresponding HPI sub-category), whose price formation is strongly influenced by the location component.

Such uniqueness, which is also found in other European countries to a lesser extent (Cyprus and Romania), enables the derivation of valuable insights that can aid in asset allocation. The inclusion, within a residential real estate portfolio, of a share of apartments located in Italy, better if located in the consolidated urban territory (thus included within the HPI for existing dwellings), allows geographical differentiation of investment risk and provides protection against inflationary pressures, which are advantages that other European countries do not offer.

A possible progression of this work, which could be developed in future studies, is to analyse the relationship between the residential properties market, the inflationary dynamics, and other socio-demographical variables. Factors such as population and income could show interesting correlations with the indicators already involved in the present study, giving rise to further considerations which can have implications on asset allocation strategies useful for investors.

Note: This study has been developed within the current research P.R.I.N. Project 2022: "INSPIRE—Improving Nature-Smart Policies through Innovative Resilient Evaluations", Grant number: 2022J7RWNF.

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